PO-0669

Promising outcomes using helical arc therapy for radical treatment of oropharyngeal cancer

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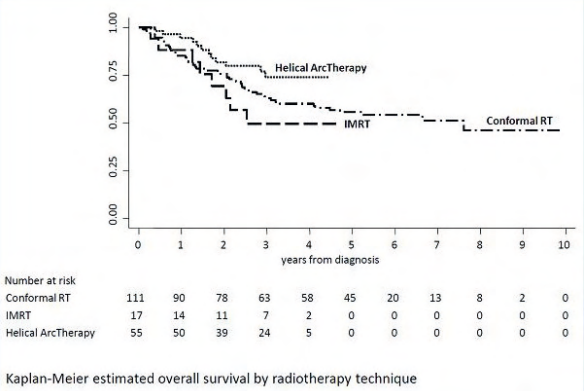
Purpose/Objective: Cambridge University Hospitals (CUH) has been routinely treating patients with Head & Neck Squamous Cell Carcinoma with Image-Guided/Intensity Modulated Radio Therapy (IG/IMRT) using helical arc therapy (HAT) since 2008. We compared outcomes for patients with oropharyngeal cancer treated using HAT with historical control cohorts treated using conformal radiotherapy techniques or 'step and shoot' IMRT delivered on a conventional linear accelerator.
Materials and Methods: We retrospectively reviewed patients treated radically with radiotherapy for primary oropharyngeal squamous cell carcinoma at CUH between April 2002 and April 2010 (recurrent disease, non-squamous pathology or palliative treatment were excluded). 183 patients were identified for whom sufficient data could be demonstrated, 141 (77%) were male and 42 (23%) female. Median age at diagnosis was 58 years (range 30 - 83). Commonest site for primary tumour was tonsil (95 patients, 51.9%) followed by tongue base (68 patients, 37.2%). Most patients treated were stage 3 (35 - 19.2%) or stage 4 (127 - 69.7%). 62 patients underwent neck surgery - 59 patients (32.2%) had unilateral neck dissection, 3 (1.6%) had bilateral nodal clearance. 95 patients (52%) had concomitant chemoradiotherapy (cisplatin or cetuximab) and only 3 patients (1.6%) had induction chemotherapy. Over 90% of patients were treated to 68 Gy in 34 daily fractions over seven weeks. Other schedules, each used for 5 patients or less, included 70 Gy in 35 #, 65 Gy in 30 # and 55 Gy in 20 #. Conformal radiotherapy was used for 111 (60.6%) patients between 2002 & 2008, 17 (9.3%) had IMRT delivered on a conventional linac (2007-09) and 55 patients (30.1%) were treated with helical arc therapy (2008-10). The patients treated by each method had similar distributions of age, disease site and stage, and similar numbers underwent neck surgery. Increasing use of concomitant chemoradiotherapy was evident (41.8% in conformal group, 64.7% in IMRT group and 74.5% in HAT group).
Results: Median follow-up was 4.4 years and for the 'conformal RT', 'IMRT' and 'HAT' groups was 5.6, 3.7 and 3.2 years, respectively. Kaplan-Meier survival probability estimates for recurrence-free survival and overall survival at two years showed improved results for patients treated with HAT compared to patients treated using our prior techniques. HAT also resulted in a lower ratio of loco-regional recurrence to distant relapse suggesting effective primary disease control. T-stage was a strong prognostic indicator and is associated significantly with disease-free and overall survival at two years (both p <0.001).



Kaplan-Meier estimated overall survival by radiotherapy technique

		Conformal RT	IMRT	TomoTherapy
	Patients treated	111	17	55
2-Year Survival	Overall survival	75.7%	69.3%	81.9%
	Recurrence-free survival	71.9%	57.0%	80.6%
Principle site of recurrence	Loco-regional	11 (10%)	2 (11.8%)	3 (5.5%)
	Neck nodes	4 (3.6%)	1 (5.9%)	2 (3.6%)
	Distant metastases	7 (6.3 %)	0 (0%)	4 (7.3%)

Conclusions: Local control and overall survival statistics for patients with oropharyngeal cancer treated at Cambridge University Hospitals using HAT and concomitant chemotherapy were better than for historic controls. Tumour T-Stage at diagnosis was a strong prognostic indicator for both disease-free and overall survival at two years.

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The prognostic impact of tumor volume in advanced nasopharyngeal carcinoma

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Purpose/Objective: To investigate the prognostic effect of tumor volume on patients with advanced nasopharyngeal carcinoma (NPC).
Materials and Methods: From February 2000 to June 2006, a total of 181 patients with biopsy-proven NPC, no distant metastasis, and available pre-treatment magnetic resonance imaging were retrospectively reviewed. Most of the patients (95.6%) had stage III/IV diseases. All patients were treated by 10-weekly neoadjuvant chemotherapy and radiotherapy. We delineated the contour of the primary tumor, retropharyngeal and neck nodes. The tumor volume was calculated by the Eclipse™ treatment planning software. PTV, NTV, TTV indicated tumor volumes of primary site, regional nodes, and total tumor. The end-points included subsequent distant failure rates, nasopharynx failure-free survival (NPFFS), distant metastasis failure-free survival (DMFFS), relapse-free survival (RFS) and overall survival (OS).
Results: After a minimal follow-up of 60 months for living patients, there were 55 failures – 8 in primary, 3 in regional, 34 in distant, 2 in primary+ regional, 6 in primary+ distant, 1 in regional+ distant, and 1 in primary+ regional + distant sites. The PTV and NTV were positively correlated withT-stage and N-stage (P<0.0001). The range of TTV was 7.99 – 323.65 cm^3, with a median of 52.33 $cm^3$and a mean of 66.45 cm^3.The median TTV of stage II, III, and IV were 28.28, 38.81, and 68.06 cm^3respectively (P<0.0001). PTV affects NPFFS (P=0.0252) and OS (P=0.0281) significantly. NTV affects DMFFS (P<0.0001) and OS (P=0.0028)significantly. Patients with tumor relapse had significantly higher TTV than those without relapse (median 45.95 vs. 69.53 cm^3, P<0.0001). The tumor relapse rates between the patients with TTV ? and < 54.96 cm^3 were 47.0% (39/83) and 16.3%(16/98), respectively (P<0.001).The distant failure rates between the patients with TTV ? and < 54.96 cm^3 were 37.3% (31/83) and 11.2%(11/98), respectively (P<0.001).The rates of 7-year DMFFS, RFS, and OS in patients with TTV ? 54.96 cm^3 were significantly lower than those with TTV < 54.96 cm^3.The TTV also affect NPFFS with a borderline significance (P=0.0553).
Conclusions: PTV is correlated with T-stage and affects NPFFS and OS. NTV is correlated with N-stage and affects DMFFS and OS. TTV is correlated with overall stage and has a significant effect on tumor relapses and patient survivals in advanced NPC.

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Patterns of failure after a comprehensive approach for salivary glands-sparing imrt in head-and-neck cancer

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Purpose/Objective: To analyse the patterns of locoregional (LR) failure in patients (pts) with head-and-neck cancer (HNC) treated with intensity-modulated radiotherapy (IMRT) aiming to spare the parotid glands (PG) the submandibular glands (SMG) and the accessory salivary glands represented by the oral cavity (OC).
Materials and Methods: Between September 2009 and August 2011, 70 consecutive pts with squamous cell HNC treated with definitive bilateral neck IMRT were included. The disease was stage III-IV and stage I-II in 77% and 23% of pts respectively. The primary tumor site was the OC (8 pts), oropharynx (31 pts), hypopharynx (17pts), larynx (10 pts), nasopharynx (3 pts), and 1 patient had unknown primary tumor. A simultaneously integrated boost (SIB) technique with 3 dose levels (PTV70-66, PTV63-60, PTV56-54 Gy) was used. 69% of pts received a concomitant treatment. The FDG-PET and CT scan of the recurrence were fused with the initial planning CT. Contours of the failure volumes (Vf) were defined taking into account all clinical examination, radiological imaging and histological information. Failures were categorized as 'in-field' if more than 95% of the Vf was covered by 95% of the prescription dose, 'marginal' if 20% to 95% of the Vf was encompassed by 95% of the prescription dose, and 'out-of-field' if less than 20% was contained within the 95% dose. Dose-volume histograms were calculated to analyse the dose received by Vf. The doses delivered in the salivary glands and OC spared were assessed. Xerostomia was assessed according to Radiation Therapy Oncology Group (RTOG) criteria.
Results: With a median follow-up of 20 months (range: 6-35), the 2-years LR control and overall survival rates were 76.5% (95% confidence